enough to accommodate the stroke of the latter when the solenoid is energized.

When winding 104 is energized to actuate solenoid 100, armature 106 is pulled downwardly, thereupon pushing downwardly on gang plate 90 which in turn pushes downwardly on the valve-actuating balls 48. The latter in turn push downwardly on the plungers of both valves 52 and 54, opening them. There is a slight recess in gang plate 90 to accommodate the head of screw 49 when the gang plate is pushed downwardly. The use of balls 48 rather than a member rigidly connected to gang plate 90 provides a self-aligning operation and prevents any binding up of plunger 152 with insert 57 due to any slight misalignments of the solenoid armature or ganging plate with respect to the valve members in the repeated operation of the solenoid. When solenoid housing 110 is secured tight on valve block 51, valves 52 and 54 will be opened to their maximum possible extent when the solenoid is actuated. However, because the mounts 108 are somewhat resilient, housing 110 can be mounted on the valve block with a small and variable amount of clearance therebetween, such that the extent to which valves 52 and 54 will be opened when solenoid 100 is activated will be somewhat less than the maximum amount possible. Gang plate 90, and the overall configuration and nature of valve 50 thus makes it possible to open both valves 52 and 54 simultaneously, by a single actuating signal, and it does so by a simple and relatively inexpensive component.

In connection with the means for actuating valves 52 and 54, it is to be noted that instead of a solenoid or like control component which operates a mechanical ganging means, such as is discussed in the preceding paragraph, it is also quite possible to merely use controlled air pressure to depress the valve plungers. In this instance, the solenoid 100 and ganging plate member 90, and the balls 48 are not required. Instead, an upper housing (not shown) is provided for the valves which defines a closed air chamber immediately above the plungers, with a chamber shape which may closely approximate the shape of the ganging plate member 90. With such an apparatus, the admission of pressurized air into the chamber, through an appropriate inlet therein, will simultaneously force the plungers downwardly, while the release of such air pressure will result in the immediate reseating or closing of the valve plungers.

In the system of the invention, the solenoid 100 (or the control member for the pressurized air of the system just described), and thereby the entire valve means 50, is controlled by a pressure switch 60 which is operably connected by an air line 61 to pressurized container 30 (FIG. 1). Thus, the operation of switch 60, and of the valve 50, is a function of the pressure in the container 30, and which 60 can be adjusted to activate at any desired pressure within a given range. Furthermore, switches of this nature are readily available which have a lag in their operation, and which deactivate at a lower pressure than that at which they actuate, Also, such switches are obtainable with a variable lag, and switch 60 is preferably of the latter type.

After leaving the valve means 50, pressurized air passes through line 140, and pressure-forced lubricant through line 141, to metering valve manifold 70 (FIG. 1). Such a device is disclosed and claimed in U.S. Pat. No. 3,050,083, issued to C. J. Verway on Aug. 21, 1962, and owned by the assignee of the present invention. Generally, such a device has any number of double tube means, preferably coaxial tubes 73, leading from it which can supply lubricant or a lubricant mist through a nozzle 76 to various lubrication points. Each coaxial tube 73 preferably comprises an inner rubber or plastic tube 74 for carrying liquid to the nozzle 76 and an outer tube 75 of copper or the like, for carrying air to the nozzle 76. Adjustable metering screws or valves 71 meter the flow of liquid through passages in the manifold and out of tube 74, and a similar adjustable metering screw or valve, (not shown in the drawing) on the opposite side of the manifold meters the flow of air through the manifold and out of outer tube 75.

OPERATION

In operation air flows from the air supply source 10 into pressurized container 30 at a rate which is predetermined and controlled by adjustment of a metering valve 21. Pressure switch 60 is set to activate and complete a circuit to solenoid 100 at a particular predetermined pressure level. When the pressure in container 30 reaches that level, pressure switch 60 is activated and allows electrical current to flow to winding 104 of solenoid 100, which is activated and forces its armature 106 and the gang plate 90 downward. This in turn forces plungers 152 of valves 52 and 54 downward, allowing air to flow through valve 52 and lubricant to flow through valve 54. Lubricant flows to the metering valve manifold 70 and to the nozzles 76 through the inner tubes 74 of coaxial tubes 73. If a spray or mist-type system is not required, the nozzles 76 are not necessary, and the lubricant can be directed through its tube directly to the lubrication point, Where a mist application is required, air flows to metering valve manifold 70 and to nozzles 76 through the outer tubes 75 of coaxial tubes 73. At each nozzle 76, air and lubricant will form a lubricant mist which will spray outwardly from the nozzles. The rate of flow of lubricant through each nozzle can be varied by use of the adjusting valve 71. The rate of flow of air through a given nozzle 76 can be varied by adjusting the appropriate valve on the other side of the metering valve manifold 70. If desired, the flow of air to any lubrication point can be completely eliminated by completely closing the appropriate metering valve or valves. In such a case, the system would be applying lubricant under pressure, rather than a lubricant mist.

As air and lubricant flow from the container 30 through double valve means 50, the pressure in container 30 will begin to drop. When it reaches a predetermined low level, the pressure switch 60 will deactivate. As suggested previously, the latter pressure level is predetermined by either the set lag of the particular pressure switch 60, or if the appropriate type of switch 60 is used, by adjusting the lag to a desired level. When the pressure switch 60 deactivates, it will open the electrical circuit to the solenoid 100, which will likewise deactivate. This allows the springs 53 to seat their respective valve member 56 and thus close both valves 52 and 54, forcing gang plate 90 and armature 106 upwardly. The flow of air through air line 40 and the flow of lubricant through lubricant line 41 is then shut off. In the meantime, air will continue to flow from the air supply means to pressurized container 30, at the predetermined rate established by metering valve 21. Thus, the pressure in the pressurized container will once again begin to build up and will eventually reach a level which will activate pressure switch 60. Thus, the process of opening and closing the valves 52 and 54 of double valve means 50 will be repeated, and the supply of lubricant and pressurized air will be of a pulsating nature.

The frequency of this pulsating repetition can be varied by either adjusting the metering valve 21, or the pressure switch 60, or both. By making these adjustments, one can make a single lubrication system of uniform construction adaptable to any number of machines or operations which require lubrication. The need for a lubrication system which is custom engineered to a particular machine or operation is therefore eliminated.

It is understood that the above disclosure is merely a preferred embodiment of this invention, and that a number of changes and modifications can be made on this disclosure without departing from the broader aspects of the invention.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows.

1. A pressurized lubrication system, comprising in combination: a source of gas under pressure; an container for holding a volume of gas under pressure and a quantity of liquid pressurized by said gas volume; means for allowing gas to flow from said source to said container, said means including metering means for regulating such gas flow; conduit means for directing gas to flow from the volume thereof in said container to a lubrication point, said means including a first valve means